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**A localized Wnt signal orients asymmetric stem cell division in vitro.**

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**Authors:** Shukry J Habib, Bi-Chang Chen, Feng-Chiao Tsai, Konstantinos Anastassiadis, Tobias Meyer, Eric Betzig, Roel Nusse

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**Public Summary:**

Developmental signals such as Wnts are often presented to cells in an oriented manner. To examine the consequences of local Wnt signaling, we immobilized Wnt proteins on beads and introduced them to embryonic stem cells in culture. At the single-cell level, the Wnt-bead induced asymmetric distribution of Wnt- $\beta$ -catenin signaling components, oriented the plane of mitotic division, and directed asymmetric inheritance of centrosomes. Before cytokinesis was completed, the Wnt-proximal daughter cell expressed high levels of nuclear  $\beta$ -catenin and pluripotency genes, whereas the distal daughter cell acquired hallmarks of differentiation. We suggest that a spatially restricted Wnt signal induces an oriented cell division that generates distinct cell fates at predictable positions relative to the Wnt source.

**Scientific Abstract:**

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